DOCUMENT RESUME

ED 373 738 IR 016 748

AUTHOR Marcinkiewicz, Henryk R.
TITLE Practicing vs Future Teachers: Comparisons and Correlates of Computer Use.
PUB DATE 94
NOTE 7p.; In: Proceedings of Selected Research and Development Presentations at the 1994 National Convention of the Association for Educational Communications and Technology Sponsored by the Research and Theory Division (16th, Nashville, TN, February 16-20, 1994); see IR 016 784. For related article, see IR 016 749.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Beliefs; Comparative Analysis; Computer Attitudes; *Computer Uses in Education; Correlation; Educational Practices; Educational Technology; Education Majors; Elementary Education; *Elementary School Teachers; Expectation; Higher Education; Locus of Control; *Predictor Variables; Preservice Teacher Education; Self Concept; Teacher Attitudes; Undergraduate Students
IDENTIFIERS *Preservice Teachers

ABSTRACT

The variables that are related to teachers' use of computers were studied using 2 groups: 170 practicing elementary school teachers and 167 undergraduate education majors (preservice teachers). Computer use was classified into nonuse, utilization, and integration using the Levels of Use Scale developed by the author and others. Expectancy was assessed by teacher locus of control and self-competence, with teacher locus of control reflecting teachers' beliefs in their influence over student outcomes. The levels of use reported by practicing teachers differ widely from the preservice teachers' expectations of future levels of use. Preservice teachers overwhelmingly expect to use computers for teaching. Computer use was predicted for both groups by variables that are highly correlated: self-competence and perceived relevance. Because the expectations of computer use by preservice teachers are high, the new generation of teachers may allow the promise of educational computing to be fulfilled. One table summarizes findings. (Contains 24 references.) (SLD)

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Title:

Practicing VS Future Teachers: Comparisons and Correlates of Computer Use

Author:

Henryk R. Marcinkiewicz, Ph.D.
University of South Dakota
School of Education
414 E. Clark St.
Vermillion, South Dakota 57069–2390

IR016748

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Perspectives

There is much support for the opinion that educational technology—especially computer technology—could have a major positive impact on improving the educational system (See The National Task Force on Educational Technology, 1986; Shanker, 1990; Sheingold & Hadley, 1990; United States Office of Technology Assessment [OTA], 1988). Indeed, the availability of computers for teaching has increased rapidly (OTA, 1988). Yet, despite the increased availability and support for computers in teaching, relatively few teachers have integrated them into their teaching. A recent survey of teachers who were exceptional users of computers for teaching averaged only about one such teacher per school (Sheingold & Hadley, 1990). This paucity of teachers existed even though the availability of computers (59) in the schools surveyed was more than double the average number of computers (26) reported available for schools in the United States (Becker, 1989). Extraordinary availability of computers was not matched by an abundance of extraordinary users of computers. The result of this imbalance is that computers are underutilized.

This research was undertaken to gain insight into what teacher variables may be related to their computer use. First, computer use was classified as a process of the adoption of innovation (see for example Hall, 1982; Rogers 1962, 1983; Rogers & Shoemaker, 1971; Rutherford & Hall, 1982) or more specifically Instructional Transformation (Rieber & Welliver, 1989; Welliver, 1990). Secondly, teachers' computer use was examined from an internal perspective—of the influence of personological variables to levels of computer use. In a comprehensive study of the implementation of innovation in education (Berman & McLaughlin, 1977) this class of variables was excluded. Yet, information about the internal variables—the predispositions and the decision-making processes of the person—may be the most valuable for influencing behavior or performance (See also Coovert & Goldstein, 1980; Gallo, 1986; Jorde-Bloom & Ford, 1988). This viewpoint was supported by data gathered in Sheingold and Hadley's (1990) survey from which teachers who were exceptional users of computers for teaching had been characterized as being highly motivated. We focused on motivation since it appeared to be a dominant internal characteristic. From within the broad construct of motivation, Expectancy Theory (Vroom, 1964) guided the selection of variables.

Sample and Setting

Practicing teachers and preservice teachers were studied. There were 170 elementary school teachers constituting the "practicing group." Teachers were eligible to participate in the study if they and their schools met criteria which controlled for the influence of environmental factors and ensured that the of availability of computers was uniform for the groups of teachers. First, the teachers taught a variety of subjects. This was necessary to control for the influence of the dominance of computer use for a specific subject. For this reason elementary school teachers were studied since they typically teach a variety of subjects. Second, computers had to be available to teachers. Availability was defined as a computer-to-pupil ratio of 1 : 44. (In fact, all teachers' schools had a ratio of better than 1 : 25.) Third, computers had to have been available at the schools for at least three years. Four schools from an eastern state participated.

There were 167 undergraduate students constituting the "preservice" group. Two different teacher locus of control scales were used with this group. One half used the Rose and Medway scale (1981); the other section used the Maes and Anderson scale (1985). There were 86 and 81 participants respectively. The preservice teachers differed from the

practicing teachers also in that they were instructed to complete the questionnaires based on their expectations (Marcinkiewicz & Grabowski, 1992).

Method

Computer use, the dependent variable, was classified into three ordered levels: *Nonuse*, *Utilization*, and *Integration* using the Levels of Use scale (Marcinkiewicz, in press; Marcinkiewicz & Welliver, 1993) based on the Model of Instructional Transformation. The independent variables were: innovativeness, teacher locus of control, perceived relevance (of computers to teaching) and self-competence (in the use of computers). These last three variables fit the formula of expectancy theory which was structured to predict behavior based on three elements: 1) valence—a goal one values or desires; 2) expectancy–the expectation that one's effort is capable of achieving some performance; and 3) instrumentality–the belief that an achieved performance results in attaining the valued goal (Vroom, 1964). The performance studied was the use of computers for teaching. The goal of the performance was "quality instruction." Valence of providing quality instruction was assumed to be true and positive for teachers.

Expectancy was assessed by teacher locus of control and self-competence. Teacher locus of control reflected teachers' belief in their influence over students' outcomes. The Teacher Locus of Control Scale by Rose and Medway (1981) and the Teacher Role Survey by Maes and Anderson (1985) were used. Self-competence reflected teachers' feelings of capability in achieving competence in using the computer in teaching. An originally developed measure was used. Instrumentality was assessed by perceived relevance—teachers' perception of computer use as relevant to teaching. An originally developed measure was used.

Innovativeness defined as "willingness to change" was assessed using the Innovativeness Scale by Hurt, Joseph, and Cook (1977). Data were collected for three relevant demographic variables: age, gender, and years of computer experience. An attribute which the demographics share contrasts them importantly with the other variables—they are not amenable to influence by any sort of intervention, remediation, or staff development. Yet, they may be significant in influencing teachers' computer use. All variables were assessed using a composite questionnaire.

Results

Table 1 shows the distribution of the groups by levels of computer use. More practicing teachers were at the Nonuse level than were preservice teachers. For preservice teachers, the percentage at the Nonuse level appears to be nominal.

Within the practicing group, the Nonuse and Integration levels were similar—roughly half each of the group total. Within the Preservice group, the greatest number of respondents was at the Utilization level.

Table 1
Classification of Sample Groups by Levels of Computer Use

Computer Use Levels	Practicing Teachers	%	Preservice Teachers	%
Nonuse	71	43.5	4	2.7
Utilization	79	48.5	126	84
Integration	13	8.0	20	13.3
Total	163	100	150	100

Note: *n* excludes observations with missing variables.

To determine which level of computer use distinguished the two groups statistically, a chi-square test was computed. The 2 x 3 chi-square was significant $c^2(2, n = 337) = 69.06$, $p < .01$) and verified the apparent differences between the expected and the reported computer use of the groups. Nonuse distinguished these two groups the most; the value for this level contributed the most to the overall c^2. The differences in the groups at the Utilization level contributed somewhat to the c^2. The differences between the groups for the Integration level contributed nominally.

Univariate intercorrelations of all variables were also computed. The correlations between perceived relevance and self-competence were high for both the practicing ($r = .53$; $p < .001$) and the preservice group ($r = .376$; $p < .001$). The same variables were both most highly correlated with computer use for both groups: for practicing teachers, self-competence ($r = .42$; $p < .001$) and perceived relevance ($r = .33$; $p < .001$); for preservice teachers, perceived relevance ($r = .28$; $p < .01$) and self-competence ($r = .23$; $p < .05$). These relationships may support the theoretical complementary nature of these two variables.

Stepwise logistic regressions were computed to identify which of the variables contributed to computer use. A significance level of $p = .05$ was the criterion for adding and retaining variables in the regression models. For the practicing teachers, two variables were retained. Self-competence $c^2(2, n = 170) = 19.07$, $p < .001$ and innovativeness $c^2(2, n = 170) = 5.12$, $p < .05$ were identified as most closely related to teachers' levels of computer use. For the preservice teachers, perceived relevance of computers to teaching $c^2(1, n = 167) = 12.06$, $p < .001$ was identified as most closely related to their expected levels of computer use. No other variables from the set contributed to the predictiveness of the respective models.

There was no one predictor common to both groups of teachers, although, the high correlations between self-competence and perceived relevance for both groups suggest that these variables may share attributes.

Analysis

The reported levels of use of practicing teachers differs widely from the expected levels of use of preservice teachers. Most importantly, preservice teachers overwhelmingly expect to use computers for teaching.

As for the correlates and predictors of computer use, it appears that there are shared variables for both groups. This suggests consistency of the variables in their relationship to teachers' computers use whether actual or expected.

Educational importance

This research was motivated by the concern that practicing teachers were underutilizing computers, and that perhaps preservice teachers' expected computer use would mirror the low levels of the practitioners. The results show that preservice teachers' expectations of computer use are high. This may be an indication that the expectations of the new generation of teachers will result in more integrated computer use in teaching, allowing the promise of educational computing to be fulfilled.

Computer use was predicted for both groups by variables which are also highly correlated, namely, self-competence and perceived relevance. In planning intervention, remediation, or staff development—designing instruction for computer use, these characteristics might deserve addressing.

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